

## PATRICK RUSSELL AND NATURAL HISTORY OF THE COROMANDEL

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Russell's Viper *Daboia russelii* occurs almost in all South Asian countries and is a major cause of human fatality. The biological name of this reptile celebrates Patrick Russell (1726-1805), a Scottish surgeon and naturalist, who worked in the Madras Presidency. He initiated the formal study of snakes of India. Patrick Russell accompanied his younger brother Claud Russell, from Edinburgh to Visakapatnam on the Coromandel Coast, when Claud was offered the post of Administrator of Visakapatnam in 1781. From Visakapatnam, Patrick travelled south to meet Johann Gerhard König at Tarangampadi in June 1781. On König's death in June 1785, the Governor of Madras offered the post of Botanist-Naturalist to Patrick till then held by König. Russell accepted the position in November 1785 and worked in the Coromandel until 1789. On acceptance of the job, Russell's first dictates were to catalogue the economically useful plants of Madras and to publish König's scientific notes. Snakes were a problem in the Madras Presidency, especially in rural areas. To enable people to distinguish the poisonous from the non-poisonous, Russell developed and distributed an advisory notice that included illustrations of the mouth parts of common snakes and descriptions as to whether they were poisonous or not. During his stay in the Madras Presidency, Russell as a medical practitioner, supported Tanjore pills, a locally made, purported remedy for snake bites, although he rejected its validity later, after his return to London. He presented the bamboo pith material (*tabashir*), an established source of silica, at the Royal Society meeting in 1790. While in the Coromandel, Russell gathered information about the habits and reputations of several snakes and their local names. He tested their venomous nature. He used Linnean criterion referring to the presence (or absence) of abdominal and sub-caudal scuta to separate his first collection of 43 snake taxa. He determined three genera: *Boa*, *Coluber*, and *Anguis*. Russell established *Katuka-rekula-poda* (Telugu) as a venomous snake, next in toxicity only to the spectacled Indian Cobra *Naja naja*. Testing the clinical features of bites of venomous snakes in dogs and chicken, he described the neurotoxic and haemorrhagic manifestations of viper venoms. He donated his collection of snake skins to the British Museum (Natural History), London. He published the first volume of his book AN ACCOUNT OF INDIAN SERPENTS COLLECTED ON THE COAST OF COROMANDEL in 1796; the first and second parts of the second volume appeared in 1801 and 1802. The third and fourth parts of second volume were published, after his death, in 1807 and 1809. Edward Nicholson (Surgeon, Madras Medical Establishment, Bangalore (now Bengaluru)), who wrote a major treatise on Indian snakes (1874), values Russell as a pioneer in Indian Zoology.

**Key words:** Alexander Russell, Claud Russell, Coromandel, *Daboia russelii*, Johann Gerhard König, *Katuka-rekula-poda*, Madras Presidency, Patrick Russell, Russell's Viper, *tabashir*, Tanjore pills, *Vipera russelli*, Visakapatnam, William Roxburgh

## INTRODUCTION

The Russell's Viper *Daboia russelii* (Shaw et Nodder) (previously *Vipera russelli*) (Adler *et al.* 2000) occurs almost in all southern and south-eastern Asian countries and is a major cause of human fatality. Russell's Viper and Common Cobra bites account for 75% of deaths in Sri Lankan farms (Goldfrank *et al.* 2002). The venom of *D. russelii* has evoked considerable interest in medicine. Its pre-coagulant activity has been thoroughly studied to understand the mechanism of blood clotting in humans. Up to 70% of the protein venom is phospholipase. Clinical effects of phospholipase are haemolysis, rhabdomyolysis, pre-synaptic neurotoxicity, vasodilatation, and shock. Russell's Viper venom induces renal failure. The venom composition varies depending on the geography of distribution of the reptile, indicating subspecific variation in the taxon (Jayanthi and Gowda 1988; Tsai *et al.* 1996). Based on multivariate morphometric and

mitochondrial-DNA data, the Thailand taxon, *D. russelii siamensis*, is now recommended to be treated as a separate species: *Daboia siamensis* (Thorpe *et al.* 2007). The other recognized subspecies are *D. russelii formosensis* (Taiwan), *D. russelii limitis* (Indonesia), *D. russelii pulchella* (Sri Lanka), *D. russelii nordicus* (northern India) (Mallow *et al.* 2003). Such variations also reflect the way in which pain and suffering manifest in humans; in Myanmar when bitten by Russell's Viper conjunctival oedema occurs, those in southern India suffer acute pituitary infarction, and those in Sri Lanka and southern India suffer rhabdomyolysis, neurotoxicity, and even ischemic strokes. Death occurs mainly due to shock, pituitary and intracranial haemorrhage, gastrointestinal haemorrhage and renal necrosis (Warrell 1989).

The biological name of this reptile celebrates Patrick Russell, a Scottish surgeon and naturalist, who worked in the Madras Presidency in the 18<sup>th</sup> century (Anonymous 1811). He pioneered the formal study of Indian snakes.

## BIOGRAPHY

Patrick Russell (Fig. 1) was born in Edinburgh on February 06, 1726; he completed his schooling and university education in Edinburgh, and graduated with an MD like his elder-half brother Alexander Russell. Alexander was a medical officer in an English factory in Aleppo (36°10' N, 37°15' E; the Ottoman Empire; now in Syria). On Alexander's return to UK, Patrick succeeded him in 1750. He endeared himself so well with the locals that the *Badshah* of Aleppo honoured that he could wear a turban — a rare privilege accorded to a non-Turk (Hawgood 1994). Alexander Russell was gathering information for a book on the natural history of Aleppo in 1756 and he sought Patrick to pursue the subject further. Driven by the affection for his brother, Patrick documented the natural history of Aleppo and transmitted information regularly to Alexander settled in Britain. For instance, Patrick meticulously recorded the details and consequences of a series of earthquakes that rocked Aleppo in 1759. His letters to Alexander describing seismology of Aleppo earthquakes are published in the *Philosophical Transactions of the Royal Society* ('Of the late earthquakes in Syria', 1760, 9: 437). Between 1760 and 1762, Aleppo experienced severe bouts of plague. When other British medical officers avoided treating the sick, Patrick voluntarily treated them, although his employment was only with the English factory. He treated so many of the afflicted that he got to know the etiology of the disease well. He recorded his observations meticulously. In 1767, he sent a note on 'inoculation for smallpox' as practiced by the Arabs, which was read in the meeting of the Royal Society of London on May 05, 1768 ('On the inoculation in Arabia', 1768, *Phil. Trans. Roy. Soc.* 12: 529). He returned to Edinburgh in 1772, travelling leisurely through Italy and France. He planned to settle in Edinburgh and set up medical practice, when his and Alexander's friend-and-colleague John Fothergill suggested that Patrick should practice medicine in London. Patrick practiced medicine in London for nearly a decade. During this period he was elected a Fellow of the Royal Society. A nomination was filed with the Royal Society (Stearns 1954; p. 85), stating:

'Patrick Russell of Buckingham Street York Buildings, Doctor of Physic, being desirous of the honour of becoming a Fellow of the Royal Society, we whose Names are underwritten do recommend him from our personal knowledge as very likely to become a useful and valuable member, being well-skilled in many branches of Natural knowledge.'

C. Morton, Jos Banks, James Stuart, John R. Forster, A. Dalrymple, S. Fleming, Dan Solander, James Welsh, Matt Roper, William Hunter, S. Horsley, Will Russell, Robert



Fig. 1: Patrick Russell

Melville, Robert Mylne, N. Maskelyne, Thos Dickson, George Forster, J. Lloyd, and Ph. Duval. — Dated April 04, 1777.

Russell was elected to the Royal Society Fellowship on November 27, 1777.

Patrick Russell accompanied his sick younger brother Claud Russell (Note: spelt 'Claud' and 'Claude' by different authors), who was offered the post of Administrator of Visakapatnam in Madras Presidency, ruled by the English East-India Company (EEIC) in 1781. While in Visakapatnam, Patrick travelled south, along the Coromandel, to meet Johann Gerhard König at Tarangampadi (Tranquebar) in June 1781. On König's death in Jegrenatpuram near Tarangampadi in June 1785, the Governor of Madras offered the post of Botanist-Naturalist to Patrick held by König. On Claud's insistence Patrick accepted the post in November 1785, worked in the Coromandel until 1791. On return to London, he spent his time writing his scientific findings for professional journals (e.g., Russell 1800; Russell and Home 1804). Russell died after brief illness in London on July 02, 1805. He was never married. In his will, he solicited that his property be administered by Sir Hugh Inglis, Josiah Porcher, and his brother Claud. Fulfilling his desire, he was buried in Marylebone burial site in a modest manner on July 08, 1805. A eulogy in the *European magazine and London Review* (Anonymous 1811) speaks highly of the character of Patrick Russell ('Russell', hereafter).

#### CONTRIBUTIONS TO SCIENCE IN THE COROMANDEL: FACTS AND SUPPLEMENTARY REMARKS

On accepting the Botanist-Naturalist post in Madras Presidency, Russell's first task was to catalogue the economically useful plants of Madras. He drew a proposal to achieve it. A principal dictate to Russell on his Coromandel



Fig. 2: An illustration from 'An Account of Indian Serpents Collected on the Coast of Coromandel, Containing Descriptions and Drawings of each Species, Together with Experiments and Remarks on their Several Poisons', 1796

employment was to publish König's scientific notes. Joseph Banks (1743-1820), British Botanist and founder of the 'Society of Dilettanti' (the predecessor of the Royal Society of London), was nominated to supervise the publication project. That the budget needed to publish König's scientific notes, Patrick insisted, was to be provided by Banks. By the time the budget proposal arrived in Madras from Banks and approved by EEIC, it was 1789 and Russell had resigned. William Roxburgh was appointed to that position. Russell seems to have been well disposed towards Roxburgh, which is evident in the generously worded preface (foreword-?) he wrote in Roxburgh's *AN ACCOUNT OF THE PLANTS OF THE COAST OF COROMANDEL* (Roxburgh 1795-1820). Most vitally, Russell played a significant role in convincing British botanists, Joseph Banks in particular, that a network of naturalists reporting to Kew should be established in India.

Snakes were a problem in Madras Presidency, especially in rural areas. To enable people to distinguish the poisonous from the non-poisonous, Russell developed an advisory notice that included descriptions and illustrations of the mouth parts of common snakes. In this context, Russell developed a strategy to use the ICS (Indian Civil Service) machinery to obtain information and previously collected data on India's natural history. In high likelihood this strategy inspired Edward Green Balfour to obtain climate data and details on the loss of forest cover in southern India nearly 50 years later (Balfour 1849; Grove 1996; Raman 2009). In 1787, Russell impressed on the Directors of Madras Council to distribute

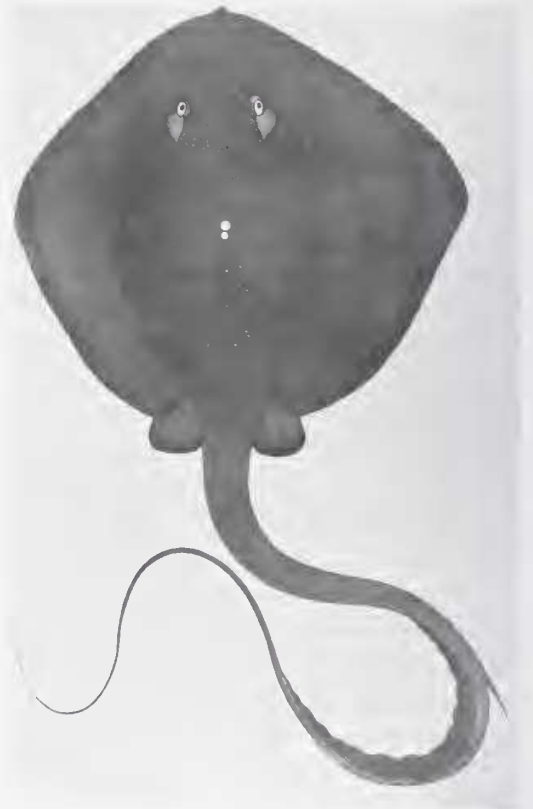


Fig. 3: An illustration from 'Descriptions and Figures of Two Hundred Fishes; Collected at Visakapatnam on the Coast of the Coromandel', 1803

questionnaires seeking information on snakes. The results were summarized, synthesized, and developed into the notice, which was printed and distributed throughout the Presidency by the Government.

In the late 18<sup>th</sup> century southern India, *vaidya* (local medical practitioners) used Tanjore Pills to treat snake poisoning. Government chemists tested and found that this pill included mercury, arsenic, black pepper, and a few other unidentifiable materials (see Nair 2005). Russell, for some reason, developed faith in these pills, although his friend and colleague William Duffin, a surgeon practicing in Vellore, disputed the usefulness and validity of these pills<sup>A</sup>. Russell argued 'efficacy was a matter of difficult discussions' and remained favourably disposed towards it; he also argued that further tests should confirm its usefulness (see Appendix). Russell worked on the plague manuscript, which he had drafted while in Aleppo, and sent the finalized version to his associates William Robertson, Adam Ferguson, and Adam Smith in UK in 1787, possibly seeking their review and remarks. This manuscript was published as *A TREATISE OF THE PLAGUE* by G.G. & J. Robinson in London in 1791, after his return to London. In addition to vital medical details, this volume<sup>A</sup> includes other useful information such as quarantine regulations and weather in the context of the disease.



By 1789 Patrick had accumulated a significant collection of fishes and plants, which he deposited with the East-India Company's Museum. On March 11, 1790, he presented at the Royal Society 'An account of the *tabasheer*, a medicine in high repute in many parts of the East'. *Tabashir*, the soft pith material from bamboo culms, was considered of extraordinary value in India. This presentation, later published in the *Philosophical Transactions of the Royal Society* in 1790 (16: 653), was first submitted as a letter to Joseph Banks, President of the Royal Society. Russell orally presented the details of *tabashir* and displayed specimens of pith material of *Bambusa arundinacea* (Retz.) Willd. (Poaceae) from which *tabashir* was obtained. Worthwhile it would be here to refer to the study of *tabashir* by Jacques Louis Macie (who changed his name to James Smithson in 1802) published in the *Philosophical Transactions of the Royal Society* in 1721, which determined *tabashir* as the near-pure form of siliceous (pure form of silica). *Tabashir* occurs in the nodes of the female trees of *B. arundinacea* and includes silica at about 90%; it also includes iron (as peroxide), calcium, alumina (aluminium oxide), choline (a species of B-complex vitamins), and betaine (a neutral compound with positively charged cationic functional group). Traditional medical practice of India values *tabashir* as an expectorant, tonic, stimulant, aphrodisiac, and uses it in treatment of blood-borne tuberculosis, bronchitis, and asthma (Puri 1970). Blended minerals render *tabashir* as an effective remineralizing agent useful in treatments of osteoarthritis and osteoporosis (Karmick 1975).

Patrick Russell's favourite brother Alexander died in the UK in 1768 leaving his notes on the natural history of Aleppo unfinished and the proposed volume unpublished. Patrick Russell completed the task and published NATURAL HISTORY OF ALEPPO as two volumes with G.G. & J. Robinson in London in 1794: the first volume carried Alexander Russell's name as the author (although Patrick Russell did much work on this volume, he has preferred to refer himself as the 'editor'), whereas the second carried his name as the author.

While in the Coromandel, Russell was concerned with the lack of any systematic knowledge of snakes and the effects of snakebites. He gathered information about the habits and reputations of several snakes and their local names. He tested their venomous nature. He used the Linnean criteria of the presence or absence of abdominal and of sub-caudal scuta to separate his first collection of 43 snake taxa. He determined three genera in this collection, namely *Boa* (Squamata: Boideae), *Coluber* (Squamata: Colubridae), and *Anguis* (Squamata: Anguillidae). He also came across a poisonous snake, referred in Telugu as *Katuka-rekula-poda*,<sup>B</sup> (Vijayaraghavan 1998). He included an illustration of this reptile in his book, which was later described as *Coluber russelli* by George Shaw and Fredrick Nodder (British Museum, Natural History, London) in NATURALISTS MISCELLANY (1797), subsequently revised as *Vipera russelli* in 1890 (see David and Dubois 2001). The current valid binomial is *Daboia russelii*. This came to be known as Russell's viper.

Russell established that *Katuka-rekula-poda* is a venomous snake, next in toxicity only to the spectacled cobra (*Naja naja*). Testing the clinical features of bites of venomous snakes in dogs and chicken, he described the neurotoxic and haemorrhagic manifestations of viper venoms. On return to UK, he donated his collection of snake skins to the British Museum (Natural History), London. He published the first volume of his book AN ACCOUNT OF INDIAN SERPENTS COLLECTED ON THE COAST OF COROMANDEL in 1796; the first and second parts of the second volume appeared in 1801 and 1802 (Appendix). The third and fourth parts of second volume were published after his death in 1807 and 1809. On December 22, 1796, a copy of Patrick Russell's AN ACCOUNT OF INDIAN SERPENTS COLLECTED ON THE COAST OF COROMANDEL (Fig. 2) was presented to the Royal Society along with the first of two volumes AN ACCOUNT OF THE PLANTS OF THE COAST OF COROMANDEL written by William Roxburgh, which included an introduction by Russell. Russell's last book DESCRIPTIONS AND FIGURES OF TWO HUNDRED FISHES; COLLECTED AT VIZAGAPATAM

<sup>A</sup>This version is available in Anonymous (1811). Chakrabarti (2006) provides a different version: In September 1788, William Duffin – a surgeon in Vellore and a few other local western-medical practitioners wrote a rejoinder to the Madras Hospital Board, relaying the following message 'although the results of tests conducted by Government Chemists on *Tanjore Pills* were convincing, some of the materials contained in them were to be reconsidered for a general recommendation for public use'. Duffin *et al.* sought the government to publish details of ingredients of *Tanjore pills*. James Anderson submitted a report to the Government on *Tanjore Pills* listing its ingredients in November 1788; his report referred to arsenic as a major component. Because of arsenic, Anderson did not recommend use of these pills. Anderson's recommendation was disputed by William Duffin, now the Head Surgeon in Madras Hospital (date unavailable). Duffin argued that despite arsenic, he found the pills beneficial in a majority of patients he had treated, and added that he had earlier transmitted his findings to Patrick Russell, Physician-Botanist to the English East-India Company, who, in turn, had transmitted details of the *Tanjore pills* to the *Royal Society* in London. Duffin further argued that he was conducting experiments with the pills to establish its use. However, Russell in his volume on Indian snakes published in London in 1796 revised his stand on these pills describing that his experiments with these pills were inconclusive, and the pills were ineffective.

<sup>B</sup>The name *Katuka-rekula-poda* (Telugu) of the reptile what came to be known later as *Daboia russelii* raises the question of the knowledge of snakes in general and that of Russell's viper in particular in India of pre-English days. Long passages on snakes exist in the *Suśrutasaṃhitā*'s KALPASTHĀNA (Meulenbeld 1999): chapter 4 refers to a classification system, nature of poisons, and symptoms of poisoning (pp. 292-294); chapter 5 refers to treating venomous snake bites (pp. 294-295).

ON THE COAST OF THE COROMANDEL (Fig. 3) was published by G & W Nicol in London in 1803.

### CONCLUSION

Russell employed an Indian (name unavailable) from Visakapatnam to illustrate snakes and fishes for his books. He has the following to say about the skill of the artist: "A native painter whom I retained in my employment has made progressive improvement in this line. Endured by nature with a quick eye, patient and docile, he quickly learned in a short time to delineate so accurately the parts pointed out to him that his figures howsoever deficient in art and grace, may in general be relied on in respect to fidelity in representation." (Chaitanya 1994; p. 105).

Albert C.L.G. Günther's *THE REPTILES OF BRITISH INDIA* (1864) is the first, systematically organized, fauna volume on Indian snakes. Edward Nicholson (1874) (Surgeon, Army

Medical Department, Madras Presidency, Bangalore) says the following in the preface of his volume *INDIAN SNAKES: AN ELEMENTARY TREATISE ON INDIAN OPHIOLOGY WITH A DESCRIPTIVE CATALOGUE OF THE SNAKES FOUND IN INDIA AND THE ADJOINING COUNTRIES* dated April 1874: "I cannot omit to mention Russell's *ACCOUNT OF INDIAN SERPENTS, 1796*; however antique and unfitted for the guidance of the student, it will always be of interest as the work of a pioneer in Indian zoology."

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## Appendix

*Notes on Patrick Russell's volumes on snakes and fishes*

*An Account of Indian Serpents Collected on the Coast of Coromandel, containing descriptions and drawings of each species, together with experiments and remarks on their several poisons.* Volume 1. George Nicol, London, 1796. 90 pages, 46 plates (44 colour) [Presented to the Hon. The Court of Directors of the East-India Company, and published by their Order, under the Superintendence of the Author. Imperial Folio. 3l. 13s. 6d. Boards]

*A continuation of an Account of Indian Serpents Collected on the Coast of Coromandel.* Volume 2. George Nicol, London, 1801.

In Volume 1, Russell describes 43 species of snakes belonging to the *Boa*, *Coluber*, and *Anguis*. He also describes the anatomy of the mouth and the poison fangs, the experiments he conducted to estimate the role of snake bites, and details of various remedies. He describes 43 species belonging to the three Linnean genera of *Boa*, *Coluber*, and *Anguis* plus information on their poison apparatus, wherever applicable. At that point of time, his volume of immense use for the people of Madras presidency (and India) in recognizing the poisonous ones from the non-poisonous. Out of the 43 described only seven were poisonous, He comments: "... nor does the venom of any appears to be nearly as active as that of the rattle-snake. The general effects of the progress of the poison appear to be pain and subsequent contraction of the part wounded, paralysis, stupor, vomiting, convulsions, and death. These symptoms, however, are subject to occasional variations, according to the strength and other circumstances of the bitten animal, and appear to be considerably retarded by violent, exercise after being bitten." He trialled on chicken, rabbits, and dogs, and he found that larger the animal, the greater length of time occurred before its death: in one or two instances, dogs recovered; a bitten horse and pig survived. One of his key findings is that the artificial insertion of poison is much less dangerous than when the wound is inflicted by the snake itself. Chicken wounded by

poisoned lancets generally died: but the dogs that were subjected to artificial-insertion experiment recovered, some without any symptoms, and the rest with slight symptoms. The most celebrated remedy in India for the bite of a serpent is the Tanjore pill, the principal active ingredient in which is white arsenic; of which each pill, of six grains, contains about three-fourths of a grain. This was given to several dogs and chickens after having been bitten, but of these the greater number died; and in the few that recovered, the action of the medicine was so very equivocal as to destroy all confidence in it: the same may be said of the application of the actual cautery, and of alkaline and acid caustics. A few cases are given of the effects of the bite of serpents on the human species. The symptoms appear to have been very severe, and occasionally to have terminated fatally; in those that ended successfully, the Tanjore pill, Madeira wine, and eau de luce were administered separately or united, with seemingly good effects.

*Descriptions and figures of two hundred fishes; collected at Vizagapatam on the coast of the Coromandel.* 2 volumes, George & W Nicol, London, 1803.

A pioneering work illustrated by a native artist. Russell was stimulated by Banks to study the fishes of the Coast of Coromandel north of Madras: "Sir Joseph Banks, who honoured me with his correspondence, suggested how defective the history of Indian Fishes was in Europe at that time, and encouraged me to proceed" (Preface). 'The drawings of this Collection (*sic* 'in this volume'), as before mentioned, were executed by a native of India; and by the advice of artists at home have undergone only a few slight corrections' (Preface). The engravings are by Heath, others by Neele and 2 or 3 by Skelton, but for the greater part by Reeve. Due to environmental conditions Russell was unable to have the plates coloured, which was his original intention, like he had done with his previously published work on the snakes of India. 'In a hot climate, the colours of fish are more rapidly fugitive after death than in serpents. They escape while the painter is adjusting his palette...' (Preface).

